Vlasov equilibrium of a tangential layer: numerical proof for a quasi-analytical solution

N. Aunai[1], G. Belmont[2], R. Smets[2]

[1] IRAP, Toulouse, France
[2] LPP, Palaiseau, France

In this presentation, we demonstrate the validation of a recently derived theory [1], presented in an associated talk (see Belmont et al.), for asymmetric tangential current layers at kinetic equilibrium, by confronting it to kinetic simulations for the first time. We first establish the need for kinetic theory by showing the unsteadiness that arises in a kinetic simulation initialized with a Maxwellian fluid current sheet model. Second, we prove that the theoretical kinetic equilibrium recently presented is indeed steady within a kinetic simulation, which demonstrates at the same time the feasibility of such non-Maxwellian initialization of collisionless particle simulations. Finally, the results of another simulation emphasize the need for the knowledge of the whole particle distribution, as using just the moments, up to the full pressure tensor, of a steady kinetic solution, is not enough to guarantee a steady state. Because it allows one to parametrize the current sheet, contrary to previous studies, the theory, that is now validated [2], offers broad perspectives for modeling the initial state of phenomena occurring in asymmetric configurations, e.g. magnetic reconnection.

References

[1] G. Belmont, N. Aunai, and R. Smets , *Phys. Plasmas* **19**, 022108 (2012);

[2] N. Aunai, G. Belmont, and R. Smets , submitted to *Phys. Plasmas* (2013)